Permit Fact Sheet

General Information

Permit Number:	WI-0023515-10-0	
Permittee Name:	Village of Cadott	
Address:	Village Hall Box 40	
City/State/Zip:	Cadott, WI 54727-0040	
Discharge Location:	Cadott Wastewater Treatment Facility, 702 East North Rd., Cadott, WI 54727	
Receiving Water:	Yellow River (Yellow River Watershed, Lower Chippewa River Basin) in Chippewa County	
StreamFlow ($Q_{7,10}$):	5.2 cfs (cubic feet per second) value is from USGS for Station 05364000 in the Yellow River at Hwy 27	
Stream Classification:	Warm Water Sport Fish (WWSF) community, non-public water supply	
Discharge Type:	Existing, Continuous	
Design Flow(s)	Daily Maximum	0.339 MGD
	Weekly Maximum	NA
	Monthly Maximum	0.267 MGD
	Annual Average	0.167 MGD
Significant Industrial Loading?	None.	
Operator at Proper Grade?	Yes, Chad Schuebel, OIC, is certified in all plant's subclasses: A1, B, C, P, D, L, SS	
Approved Pretreatment Program?	N/A	

Facility Description

The Village of Cadott owns and operates an activated sludge wastewater treatment facility. The plant treats domestic wastewater from approximately 1,486 people. Treatment consists of a grit channel, equalization basin, oxidation ditch, final clarifier, UV disinfection, two aerobic digesters, and equipment for handling and storage of sludge. Aluminum sulfate is added before the final clarifier for phosphorus removal. Wastewater from the collection system is screened at the previous wastewater treatment facility before being pumped to the current site, which was constructed in 2012. The annual average design flow is 0.167 MGD.

Substantial Compliance Determination

Enforcement During Last Permit: No formal enforcement occurred during the last permit term.

After a desk top review of all discharge monitoring reports, CMARs, land application reports, compliance schedule items, a site visit on August 16, 2022, conducted by DNR Wastewater Engineer, Nicholas Lindstrom, and a desktop review on

March 15, 2024 completed by DNR Wastewater Engineer, Logan Rubeck, this facility has been found to be in substantial compliance with their current permit, WI-0023515-09-0.

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
702	0.171 MGD (Average from January 2018 to October 2022)	Influent: Representative influent samples shall be collected after the Huber screen, prior to pump for the force main for the new plant.
003	NA	Effluent: Representative composite effluent samples shall be collected at the outlet of the clarifier, prior to UV disinfection. Grab effluent samples shall be collected after UV disinfection.
004	23 dry U.S. tons (2022 permit application)	Aerobically digested, Liquid, Class B. Representative sludge samples shall be collected from the manhole on top of the sludge storage tank after mixing.

1 Influent – Monitoring Requirements

Sample Point Number: 702- INFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD_5, Total		mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	3/Week	24-Hr Flow Prop Comp	

Changes from Previous Permit:

Influent monitoring requirements were re-evaluated for the proposed permit term and no changes were made from the previous permit.

Explanation of Limits and Monitoring Requirements

BOD_5 and Total Suspended Solids (TSS): Tracking of BOD_5 and TSS are required for percent removal requirements found in s. NR 210.05, Wis. Adm. Code and in the Standard Requirements section of the permit.

2 Surface Water - Monitoring and Limitations

Sample Point Number: 003- EFFLUENT TO YELLOW RIVER

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD_5, Total	Weekly Avg	45 mg/L	3/Week	24-Hr Flow Prop Comp	
BOD_5, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Flow Prop Comp	
pH Field	Daily Min	6.0 su	Daily	Grab	
pH Field	Daily Max	9.0 su	Daily	Grab	
E. coli	Geometric Mean - Monthly	126 #/100 ml	Weekly	Grab	Limit effective May through September annually.
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Limit effective May through September annually. See the E. coli Percent Limit permit section. Enter the result in the DMR on the last day of the month.
Phosphorus, Total	Monthly Avg	0.4 mg/L	3/Week	24-Hr Flow Prop Comp	This is an interim limit effective through the permit term. See Phosphorus Variance permit section.
Phosphorus, Total		lbs/day	3/Week	Calculated	
Nitrogen, Total Kjeldahl		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	Total Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and Total Nitrite + Nitrate

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					Nitrogen.

Changes Previous Permit

Flow Rate: Flow monitoring was added.

Fecal Coliform and E.Coli: Fecal coliform monitoring and limits have been replaced with Escherichia coli (E. coli) limits. E. coli limits of 126 #/100 ml as a monthly geometric mean that may not be exceeded and 410 #/100 ml as a daily maximum that may not be exceeded more than 10 percent of the time in any calendar month will apply**.**

Phosphorus: The permittee has applied for an individual phosphorus variance (IPV) for this permit term. An IPV interim limit of 0.4mg/L monthly average is included in this permit term.

Total Nitrogen Monitoring (TKN, Nitrite + Nitrate, Total N): Annual monitoring in rotating quarters throughout the permit term was added to the proposed permit.

Explanation of Limits and Monitoring Requirements

Monitoring Frequencies: The "Monitoring Frequencies for Individual Wastewater Permits" guidance document (April 12, 2021) recommends that standard monitoring frequencies be included in individual wastewater permits based on the size and type of the facility, in order to characterize effluent quality and variability, to detect events of noncompliance, and to ensure fairness and consistency in permits issued across the state.

Taking into consideration guidance and requirements in administrative code, effluent monitoring frequencies for the Village of Cadott's permit were determined to be appropriate for pollutants that have final effluent limits in effect during this permit term.

BOD_5, TSS, and pH: Standard municipal wastewater requirements for BOD_5, TSS, and pH are included based on ch. NR 210, Wis. Adm. Code, 'Sewage Treatment Works' requirements for discharges to fish and aquatic life streams. Tracking of BOD_5 and total suspended solids are required for percent removal requirements found in s. NR 210.05, Wis. Adm. Code and in the Standard Requirements section of the permit. Chapter NR 102, Wis. Adm. Code, 'Water Quality Standards for Surface Waters' also specifies requirements for pH for fish and aquatic life streams.

Water Quality Based Limits and Disinfection:

Refer to the "Water Quality-Based Effluent Limitations for the Village of Cadott" dated January 6, 2023 prepared by Benjamin Hartenbower, and the WQBEL amendment dated February 29, 2024 by Benjamin Hartenbower, which were used for this reissuance.

E. Coli: Revisions to bacteria surface water quality criteria to protect recreational uses and accompanying E. coli WPDES permit implementation procedures became effective May 1, 2020. The new rule requires that WPDES permits for facilities with required disinfection include monitoring for E. coli while facilities are disinfecting during the recreation period and establish effluent limitations for E. coli established in s. NR 210.06 (2), Wis. Adm. Code. The administrative code rule changes included the following actions: revised the bacteria water quality criteria from fecal coliform to E. coli to protect recreation in ch. NR 102, Wis. Adm. Code; removed fecal coliform criteria for certain individual waters from ch. NR 104, Wis. Adm. Code; revised permit requirements for publicly and privately owned sewage treatment works in ch. NR 210, Wis. Adm. Code; and updated approved analytical methods for bacteria in ch. NR 219, Wis. Adm. Code.

Phosphorus: Phosphorus requirements are based on the Phosphorus Rules that became effective 12/1/2010 as detailed in NR 102 Water Quality Standards and NR 217 Effluent Standards and Limitations for Phosphorus. Chapter NR 217 of the Wis. Adm. Code addresses point source dischargers of phosphorus to surface waters. The code categorically limits municipal dischargers of more than 150 pounds of phosphorus per month to 1.0 mg/L unless an alternative limit is approved. NR 217 also specifies WQBELs (water quality based effluent limits) for discharges of phosphorus to surface

waters of the state from publicly and privately owned wastewater facilities, noncontact cooling water discharges which contain phosphorus, concentrated animal feeding operations that discharge through alternative treatment facilities and a facility/site that is regulated under NR 216 where the standards in NR 151 and 216 are not sufficient to meet phosphorus criteria. WQBELs for phosphorus are needed whenever the discharge contains phosphorus at concentrations or loadings that will cause or contribute to an exceedance of the water quality standards.

The permittee has applied for an individual phosphorus variance in accordance with s. 283.15, Wis. Stats. Conditions for this variance include maintaining phosphorus effluent concentrations below the interim limit of 0.4 mg/L as a monthly average, implementing the Phosphorus Pollutant Minimization Program plan dated October 2022, continued optimization for control of phosphorus, and calculating, reporting and tracking phosphorus mass discharge. This interim limit reflects a concentration that the permittee can meet without investing in additional treatment, but also prevents backsliding from the current interim limit and conditions.

Total Nitrogen Monitoring (TKN, Nitrite + Nitrate, Total N): The Department has included effluent monitoring for Total Nitrogen in the permit through the authority under §§ 283.55(1)(e), Wis. Stats., which allows the department to require the permittee to submit information necessary to identify the type and quantity of any pollutants discharged from the point source, and through s. NR 200.065(1)(h), Wis. Adm. Code, which allows for this monitoring to be collected during the permit term. Quarterly effluent monitoring for Total Nitrogen is included in the permit because of the potential for higher nitrogen loading resulting from higher flows (major facilities), higher concentrations, or both. More information on the justification to include total nitrogen monitoring in wastewater permits can be found in the "Guidance for Total Nitrogen Monitoring in Wastewater Permits" dated October 1, 2019.

3 Land Application - Monitoring and Limitations

Municipal Sludge Description						
Sample Point	**Sludge Class (A or B)**	**Sludge Type (Liquid or Cake)**	**Pathogen Reduction Method**	**Vector Attraction Method**	**Reuse Option**	**Amount Reused/Disposed (Dry Tons/Year)**
004	B	Liquid	Fecal Coliform	Incorporation when land applied	Land Application	23 Tons/Year
Does sludge management demonstrate compliance? Yes.						
Is additional sludge storage required? No.						
Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? No. If yes, special monitoring and recycling conditions will be included in the permit to track any potential problems in landapplying sludge from this facility						
Is a priority pollutant scan required? No. Priority pollutant scans are required once every 10 years at facilities with design flows between 5 MGD and 40 MGD, and once every 5 years if design flow is greater than 40 MGD.						

Sample Point Number: 004- Liquid Sludge

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Annual	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Annual	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Annual	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Annual	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Annual	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Annual	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Annual	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Annual	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Annual	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Annual	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Annual	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Annual	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite	
Nitrogen, Total Kjeldahl		Percent	Annual	Composite	
Nitrogen, Ammonium (NH4-N) Total		Percent	Annual	Composite	
Phosphorus, Total		Percent	Annual	Composite	
Phosphorus, Water Extractable		% of Tot P	Annual	Composite	
Potassium, Total Recoverable		Percent	Annual	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Sample in 2025.
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Sample in 2025.
PFOA + PFOS		ug/kg	Annual	Calculated	Report the sum of PFOA and PFOS. See PFAS

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					Permit Sections for more information.
PFSA Dry Wt			Annual	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFSA List. See PFAS Permit Sections for more information.

Changes from Previous Permit:

PFAS: Annual monitoring is included in the permit pursuant s. NR 204.06(2)(b)9, Wis. Adm. Code.

Sample Point 002: this sample point was removed since the Village of Cadott has only Class B liquid sludge, therefore, sample point 002 was repetitive of sample point 004. The only difference between the sample points were the disposal method which is still captured under DNR forms 3400-49 and 3400-52.

Explanation of Limits and Monitoring Requirements

Requirements for land application of municipal sludge are determined in accordance with ch. NR 204 Wis. Adm. Code. Ceiling and high-quality limits for metals in sludge are specified in s. NR 204.07(5). Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07 (7) for vector attraction requirements. Limitations for PCBs are addressed in s. NR 204.07(3)(k).

PFAS: The presence and fate of PFAS in municipal and industrial sludges is an emerging public health concern. EPA is currently developing a risk assessment to determine future land application rates and expects to release this risk assessment by the end of 2024. In the interim, the department has developed the "Interim Strategy for Land Application of Biosolids and Industrial Sludges Containing PFAS".

Collecting sludge data on PFAS concentrations from a wide range of wastewater treatment facilities will help protect public health from exposure to elevated levels of PFAS and determine the department's implementation of EPA's recommendations. To quantitate this risk, PFAS sampling has been included in the proposed WPDES permit pursuant to ss. NR 214.18(5)(b) and NR 204.06(2)(b)9., Wis. Adm. Code.

Water Extractable Phosphorus: Water extractable phosphorus (WEP) is the coefficient for determining plant available phosphorus from measured total phosphorus. In Wisconsin, the Penn State Method is utilized and is expressed in percent. While a total P may be significant, the WEP may show that only a small percentage of the P is available to plants because of factors such as treatment processes and chemical addition that "tie-up" phosphorus limiting the amount of phosphorus that is plant available. As part of the Wisconsin's nutrient management plan (NMP) requirements, the accounting of all fertilizers must be included over the NMP cycle. The fertilizer value of the waste needs to be communicated to the farmer and accounted for in the NMP.

4 Schedules

4.1 Phosphorus Pollutant Minimization Program

As a condition of the variance to the water quality-based effluent limitation (WQBEL) for phosphorus granted in accordance with s. 283.15, Wis. Stats., the permittee shall implement the Phosphorus PMP including any subsequent updates.

Required Action	Due Date
Annual Phosphorus Progress Report: Submit an annual progress report that shall discuss which phosphorus pollutant minimization measures have been implemented during the prior calendar year. The report shall include an analysis of trends in weekly average, monthly average and annual total influent and effluent phosphorus concentrations and mass discharge of phosphorus based on phosphorus sampling and flow data. The report shall provide an update on the permittee's: (1) progress in implementing pollutant minimization measures, operational improvements, and minor facility modifications to optimize reductions in phosphorus discharges and, (2) status of evaluating feasible alternatives for meeting phosphorus WQBELs. Note that the monthly average interim limitation listed in the permit's Surface Water section remains enforceable until new enforceable limits are established in the next permit reissuance. The first annual phosphorus progress report is to be submitted by the Date Due.	01/31/2025
Annual Phosphorus Progress Report #2: Submit a phosphorus progress report as defined above for the previous calendar year.	01/31/2026
Annual Phosphorus Progress Report #3: Submit a phosphorus progress report as defined above for the previous calendar year.	01/31/2027
Annual Phosphorus Progress Report #4: Submit a phosphorus progress report as defined above for the previous calendar year.	01/31/2028
Final Phosphorus Report: Submit a final report documenting the success in reducing phosphorus concentrations in the effluent, as well as the anticipated future reduction in phosphorus sources and phosphorus effluent concentrations. The report shall summarize phosphorus pollutant minimization activities that have been implemented during the current permit term and state which, if any, pollutant minimization activities from the approved pollutant minimization program plan were not pursued and why. The report shall include an analysis of trends in monthly and annual total influent and effluent phosphorus concentrations based on phosphorus sampling during the current permit term. The permittee shall also re-evaluate all available compliance options for meeting the final phosphorus WQBELs. If the report concludes Adaptive Management will be implemented, the submittal shall include a completed Watershed Adaptive Management Request Form 3200-139 and an adaptive management plan. If the report concludes water quality trading will be used, the submittal shall include a Water Quality Trading Plan. Additionally, if the permittee intends to seek to re-apply for a phosphorus variance per s. 283.15, Wis. Stats for the reissued permit, a detailed pollutant minimization program plan outlining the pollutant minimization activities proposed for the upcoming permit term should be submitted along with the final report.	01/31/2029
Annual Phosphorus Progress Reports After Permit Expiration: In the event that this permit is not reissued by the date the permit expires, the permittee shall continue to submit reports for the previous calendar year following the due date of annual phosphorus progress reports listed above. Annual phosphorus progress reports shall include information as defined above.	

4.1.1 Explanation of Phosphorus Pollutant Minimization Plan Schedule

This Schedule is to be implemented as a condition of the permittee's variance to water quality standards for phosphorus. Annual phosphorus progress reports update the Department on the progress made in implementing the Pollutant

Minimization Program Plan as well as quantifying reductions achieved through plant optimization and from contributing sources within the collection system.

Special Reporting Requirements

None

Other Comments:

None

Attachments:

Water Quality Based Effluent Limits dated January 6, 2023 prepared by Benjamin Hartenbower, and the WQBEL amendment dated February 29, 2024 by Benjamin Hartenbower.

Phosphorus Variance Documents
- EPA Datasheet
- PMP Plan Dated: October 2022

Expiration Date:

September 30, 2029

Justification Of Any Waivers From Permit Application Requirements

No waivers were requested from permit application requirements.

Prepared By: Victoria Ziegler Wastewater Specialist **Date:** 3/28/2024

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: January 6, 2023

TO: Phillip Spranger – SCR/Fitchburg

FROM: Benjamin Hartenbower – WCR/Eau Claire

SUBJECT: Water Quality-Based Effluent Limitations for the Cadott Wastewater Treatment Facility WPDES Permit No. WI-0023515

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBELs) using chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from the Cadott Wastewater Treatment Facility in Chippewa County. This municipal wastewater treatment facility (WWTF) discharges to the Yellow River, located in the Lower Yellow River Watershed in the Lower Chippewa River Basin. The evaluation of the permit recommendations is discussed in more detail in the attached report.

Based on our review, the following recommendations are made on a chemical-specific basis at Outfall 003:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
BOD_5			45 mg/L	30 mg/L		1
TSS			45 mg/L	30 mg/L		1
pH	9.0 s.u.	6.0 s.u.				1
E. coli				126 #/100 mL geometric mean		2
Phosphorus Interim Limit Final WQBEL				 0.40 mg/L 0.225 mg/L	 0.075 mg/L	3
TKN, Nitrate+Nitrite, and Total Nitrogen						4
Acute WET						5
Chronic WET						5,6

Footnotes:

1. No changes from the current permit.
2. Bacteria limits apply during the disinfection season of May through September. Additional limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
3. If the phosphorus variance application that was submitted is approved by EPA, the existing interim limit of 0.4 mg/L as a monthly average will be required along with a requirement for total phosphorus pollutant minimization program.
4. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen monitoring is recommended for all minor municipal permittees. Total Nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), and total kjeldahl nitrogen (TKN) (all expressed as N).
5. Three acute and three chronic WET tests are recommended in the reissued permit. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).

6. The Instream Waste Concentration (IWC) to assess chronic test results is 17%. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall be performed using a dilution series of 100%, 30%, 10%, 3% & 1% and the dilution water used in WET tests conducted on Outfall 003 shall be a grab sample collected from the Yellow River.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Benjamin Hartenbower at (715) 225-4705 or Benjamin.Hartenbower@wisconsin.gov or Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (4) – Narrative, 2016 Ammonia Calculations, Thermal Table, & Map

PREPARED BY: _____ Date: 01/06/2023

Benjamin Hartenbower, PE,
Water Resources Engineer

E-cc: Angela Parkhurst, Wastewater Specialist – Eau Claire
Nick Lindstrom, Wastewater Engineer – Eau Claire
Geisa Thielen, Regional Wastewater Supervisor – Eau Claire
Diane Figiel, Water Resources Engineer – WY/3
Chris Willger, Water Quality Biologist– Eau Claire
Kari Fleming, Environmental Toxicologist – WY/3
Laura Dietrich, Wastewater Specialist – Waukesha

Attachment #1

Water Quality-Based Effluent Limitations for
Cadott Wastewater Treatment Facility

WPDES Permit No. WI-0023515

Prepared by: Benjamin P. Hartenbower

PART 1 – BACKGROUND INFORMATION

Facility Description

The Cadott treatment facility is an activated sludge process designed for biological treatment of the Village's wastewater. Wastewater from the collection system is screened at the previous WWTP site before being pumped to the current site, which was constructed in 2012. The current site includes a grit channel, equalization basin, oxidation ditch, final clarifier, UV disinfection, aerobic digester, and equipment for handling and storage of liquid sludge. The WWTP outfall is located approximately 800 feet southwest of the current site along the north bank of the Yellow River.
Attachment #4 is a map of the area showing the approximate location of Outfall 003.

Existing Permit Limitations

The current permit, expiring on December 31, 2022, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
BOD_5			45 mg/L	30 mg/L		1
TSS			45 mg/L	30 mg/L		1
pH	9.0 s.u.	6.0 s.u.				1
Fecal Coliform May – September			656#/100 mL geometric mean	400#/100 mL geometric mean		
Phosphorus HAC Interim Limit				0.4 mg/L		2

Footnotes:

1. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
2. Under the phosphorus MDV, a highest attainable condition (HAC) limit of 0.4 mg/L was effective.

Receiving Water Information

- Name: Yellow River
- Waterbody Identification Code (WBIC): 2154500
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm Water Sport Fish (WWSF) community, non-public water supply.
- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q_{10} and 7-Q_2 values are from USGS for Station 05364000 in the Yellow River at Hwy 27, near where Outfall 003 is located.

  7-Q_{10} = 5.2 cfs (cubic feet per second)

7-Q_2 = 11 cfs

Harmonic Mean Flow = 44 cfs using a drainage area of 364 mi^2

The Harmonic Mean has been estimated based on average flow and the 7-Q_{10} using an equation from U.S. EPA's *Technical Support Document for Water Quality-Based Toxics Control* (March 1991, EPA/505/2-90-001, pgs. 88-89).

- Hardness = 65 mg/L as $CaCO_3$. This value represents the geometric mean of data from 23 samples taken in the Yellow River from 07/07/88 to 06/12/89.
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: 25% .
- Source of background concentration data: Metals data from the Chippewa River at Durand is used for this evaluation. The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background data for calculating effluent limitations for ammonia nitrogen are described later.
- Multiple dischargers: The Village of Gilman also discharges to the Yellow River, however they are not in the immediate vicinity and the mixing zones do not overlap. Therefore, the other dischargers do not impact this evaluation.
- Impaired water status: The Yellow River is listed as impaired for Total Phosphorus at the discharge location.

Effluent Information

- Design flow rate(s):

  Annual average = 0.167 MGD (Million Gallons per Day)

  For reference, the actual average flow from January 2018 to October 2022 was 0.171 MGD.
- Hardness = 144 mg/L as $CaCO_3$. This value represents the geometric mean of data submitted with the permit application from four samples collected 03/29/2022 to 04/07/2022.
- Acute dilution factor used in accordance with s. NR 106.06(3)(c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water source: Domestic wastewater with water supply from wells.
- Additives: One water quality conditioner (alum)
- Effluent characterization: This facility is categorized as a minor municipality, so the permit application required effluent sample analyses for a limited number of common pollutants, as specified in s. NR 200.065, Table 1, Wis. Adm. Code, primarily metal substances plus ammonia, chloride and hardness.
- The permit-required monitoring for phosphorus from January 2018 to October 2022 is used in this evaluation.
- Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 below, in the column titled “MEAN EFFL. CONC.”. Otherwise, substances with multiple effluent data are shown in the tables below or in their respective parts in this evaluation.

Sample Date	Copper µg/L	Sample Date	Chloride mg/L
03/29/2022	10	03/29/2022	120
04/01/2022	9	04/01/2022	126
04/04/2022	9	04/04/2022	129
04/07/2022	6	04/07/2022	128
04/10/2022	6		
04/13/2022	7		

Attachment #1

Sample Date	Copper µg/L	Sample Date	Chloride mg/L
04/16/2022	4		
04/19/2022	6		
04/22/2022	7		
04/25/2022	5		
04/28/2022	6		
1-day P_{99}	12.2	Mean	126
4-day P_{99}	9.2		

The following table presents the average concentrations and loadings at Outfall 003 from January 2018 to October 2022 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

Averages of Parameters with Limits

	Average Measurement
BOD_5	7.5 mg/L
TSS	6.0 mg/L
pH field	6.90 s.u.
Phosphorus	0.21 mg/L
Fecal Coliform	7 #/100 mL

*Results below the level of detection (LOD) were included as zeroes in calculation of average.

PART 2 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN

Permit limits for toxic substances are required whenever any of the following occur:

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99th percentile (or P_{99}) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

Daily Maximum Limit Calculation Method

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. In accordance with s. NR 106.06(3)(b), limitations based on acute toxicity are either set equal to two times the acute criteria (the final acute value) or calculated using the mass balance equation below, whichever is more restrictive.

$$\text{Limitation} = \frac{(WQC)\,(Qs + (1-f)\,Qe) - (Qs - f\,Qe)\,(Cs)}{Qe}$$

Where:

WQC =Acute toxicity criterion or secondary acute value according to ch. NR 105, Wis. Adm. Code.

Qs = average minimum 1-day flow which occurs once in 10 years (1-day Q_{10})
if the 1-day Q_{10} flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q_{10}).
Qe = Effluent flow (in units of volume per unit time) as specified in s. NR 106.06(4)(d), Wis. Adm. Code.
f = Fraction of the effluent flow that is withdrawn from the receiving water, and
Cs = Background concentration of the substance (in units of mass per unit volume) as specified in s. NR 106.06(4)(e), Wis. Adm. Code.

In this case, limits set equal to two times the acute criteria are more restrictive and this method is used to calculate the daily maximum limits shown in the table below.

The following tables list the calculated WQBELs for this discharge along with the results of effluent sampling. All concentrations are expressed in terms of micrograms per Liter (µg/L), except for hardness and chloride (mg/L).

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)
RECEIVING WATER FLOW = 4.16 cfs, (1-Q_{10} (estimated as 80% of 7-Q_{10})), as specified in s. NR 106.06(3)(bm), Wis. Adm. Code.

SUBSTANCE	REF. HARD. mg/L	ATC	MEAN BACK-GRD.	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Arsenic		340		680	136	1.9		
Cadmium	144	15.6	0.010	31.2	6.2	<2		
Chromium	144	2427	0.500	4853	971	<3		
Copper	144	21.9	1.210	43.7			12.2	10
Lead	144	152	0.338	304	61	<1		
Nickel	144	638		1275	255	<8		
Zinc	144	165	1.413	331	66	26		
Chloride (mg/L)		757		1514	303	126		129

* * The 2 × ATC method of limit calculation yields a more restrictive limit than consideration of ambient concentrations and 1-Q_{10} flow rates per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)
RECEIVING WATER FLOW = 2.30 cfs (¼ of the 7-Q_{10}), as specified in s. NR 106.06(4)(c), Wis. Adm. Code

SUBSTANCE	REF. HARD. mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Arsenic		152		918	184	1.9	
Cadmium	65	1.8	0.010	10.5	2.1	<2	
Chromium	65	93	0.500	556	111	<3	
Copper	65	7.2	1.210	37.0			9.2
Lead	65	18	0.338	109	22	<1	
Nickel	65	36		218	44	<8	
Zinc	65	82	1.413	490	98	26	
Chloride (mg/L)		395		2382	476	126	

Monthly Average Limits based on Wildlife Criteria (WC)
The effluent characterization did not include any effluent sampling results for substances for which Wildlife Criteria exist.

Monthly Average Limits based on Human Threshold Criteria (HTC)
RECEIVING WATER FLOW = 10.92 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	370	0.010	16006	3201	<2
Chromium (+3)	3818000	0.500	165170683	33034137	<3
Lead	140	0.338	6042	1208	<1
Nickel	43000		1860225	372045	<8

Monthly Average Limits based on Human Cancer Criteria (HCC)
RECEIVING WATER FLOW = 10.92 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HCC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	13.3		575	115	1.9

In addition to evaluating the need for limits for each individual substance for which HCC exist, s. NR 106.06(8), Wis. Adm. Code, requires the evaluation of the cumulative cancer risk. Because no effluent limits are needed based on HCC, determination of the cumulative cancer risk is not needed per s. NR 106.06(8), Wis. Adm. Code.

Conclusions and Recommendations: Based on a comparison of the effluent data and calculated effluent limitations, effluent limitations are not required for toxic substances.

Mercury – The permit application did not require monitoring for mercury because the Cadott Wastewater Treatment Facility is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code. In accordance with s. NR 106.145(3)(a)3, Wis. Adm. Code, a minor municipal discharger shall monitor, and report results of influent and effluent mercury monitoring once every three months if, "there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5), Wis. Adm. Code." A review of the past five years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. The average concentration in the sludge from 2018 to 2021 was 0.73 mg/kg, with a maximum reported concentration of 0.90 mg/kg. Therefore, mercury monitoring is not recommended at Outfall 003.

PFOS and PFOA –
The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98, Wis. Adm. Code. Based on the type of discharge, it is unlikely that the effluent will contain PFOS or PFOA. Previous monitoring produced a PFOS result of 0.713 ng/L and a PFOA result of 3.13 ng/L. These results are less than one fifth of the respective criteria for each substance. **Therefore, monitoring is not recommended**. If future sampling information of the effluent or source water indicates the presence of PFOS or PFOA at concentrations greater than one fifth of the criterian, monitoring requirements may change in future reissuances.

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen in ch. NR 105, Wis. Adm. Code, effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. Given the fact that the Black River Falls Wastewater Treatment Facility does not currently have ammonia nitrogen limits, the need for limits is evaluated at this time.

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)
Daily maximum limitations are based on acute toxicity criteria in ch. NR 105, Wis. Adm. Code, which are a function of the effluent pH and the receiving water classification. The acute toxicity criterion (ATC) for ammonia is calculated using the following equation:

$$\text{ATC in mg/L} = [A \div (1 + 10^{(7.204 - \text{pH})})] + [B \div (1 + 10^{(\text{pH} - 7.204)})]$$

Where:

A = 0.411 and B = 58.4 for a Warm Water Sport fishery, and
pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 1765 sample results were reported from January 2018 to October 2022. The maximum reported value was 7.30 s.u. (Standard pH Units). The effluent pH was 7.30 s.u. or less 99% of the time. The 1-day P_{99}, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 7.34 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.33 s.u. Therefore, a value of 7.34 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 7.34 s.u. into the equation above yields an ATC = 24.90 mg/L.

Daily Maximum Ammonia Nitrogen Effluent Limitations Calculation Method
In accordance with s. NR 106.32(2), Wis. Adm. Code daily maximum ammonia limitations are either set equal to two times the acute criteria (the final acute value) or calculated using the mass balance equation in s. NR 106.32(2)(e), Wis. Adm. Code.

In this case, limits calculated set equal to two times the acute criteria are more restrictive. This method is used to calculate the daily maximum limit of **50 mg/L**.

Attachment #1

Presented below is a table of daily maximum limitations corresponding to various effluent pH values. Use of this table is not necessarily recommended in the permit, but it is presented herein for informational purposes.

Daily Maximum Ammonia Nitrogen Limits – WWSF, WWFF & LFF

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	108	7.0 < pH ≤ 7.1	66	8.0 < pH ≤ 8.1	14
6.1 < pH ≤ 6.2	106	7.1 < pH ≤ 7.2	59	8.1 < pH ≤ 8.2	11
6.2 < pH ≤ 6.3	104	7.2 < pH ≤ 7.3	52	8.2 < pH ≤ 8.3	9.4
6.3 < pH ≤ 6.4	101	7.3 < pH ≤ 7.4	46	8.3 < pH ≤ 8.4	7.8
6.4 < pH ≤ 6.5	98	7.4 < pH ≤ 7.5	40	8.4 < pH ≤ 8.5	6.4
6.5 < pH ≤ 6.6	94	7.5 < pH ≤ 7.6	34	8.5 < pH ≤ 8.6	5.3
6.6 < pH ≤ 6.7	89	7.6 < pH ≤ 7.7	29	8.6 < pH ≤ 8.7	4.4
6.7 < pH ≤ 6.8	84	7.7 < pH ≤ 7.8	24	8.7 < pH ≤ 8.8	3.7
6.8 < pH ≤ 6.9	78	7.8 < pH ≤ 7.9	20	8.8 < pH ≤ 8.9	3.1
6.9 < pH ≤ 7.0	72	7.9 < pH ≤ 8.0	17	8.9 < pH ≤ 9.0	2.6

Weekly and Monthly Average Limits based on Chronic Toxicity Criteria (CTC)

The weekly and monthly average ammonia nitrogen limits calculation from the previous memo do not change because there have been no changes in the effluent and receiving water flow rates. The calculations from the previous WQBEL memo are shown in attachment #2.

Effluent Data

Samples for ammonia nitrogen were submitted with the permit application:

Sample Date	Ammonia Nitrogen mg/L
03/29/2022	25.9
04/01/2022	18.7
04/04/2022	18.8
04/07/2022	16.4
11/17/2022	<0.1
11/20/2022	<0.1
11/22/2022	<0.1
11/24/2022	<0.1
11/27/2022	<0.1
11/28/2022	<0.1
12/01/2022	3.3
Mean	7.3

"<" means that the pollutant was not detected at the indicated level of detection. The mean concentration was calculated using zero in place of the non-detected results.

Based on this comparison, there is no reasonable potential for the discharge to exceed any of the calculated ammonia nitrogen limits.

Conclusions and Recommendations
In summary, after rounding to two significant figures, the following ammonia nitrogen limitations are recommended. No mass limitations are recommended in accordance with s. NR 106.32(5), Wis. Adm Code.

Final Ammonia Nitrogen Limits

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
May – October	Variable	105	72
November – April	Variable	65	43

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

On May 1, 2020, revisions to chs. NR 102 and NR 210, Wis. Adm. Codes, became effective which replace fecal coliform limits with new *Escherichia coli* (*E. coli*) limits for protection of recreational uses. Section NR 210.06(2)(a)1, Wis. Adm. Code, includes two limits which must be included in permits for facilities which are required to disinfect:

1. The geometric mean of *E. coli* bacteria in effluent samples collected in any calendar month may not exceed 126 counts/100 mL.
2. No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 counts/100 mL.

E. coli monitoring is recommended at the same frequency that fecal coliform monitoring is required in the current permit. Because the Black River Falls Wastewater Treatment Facility permit requires weekly monitoring, the 410 counts/100 mL limit will effectively function as a daily maximum limit unless the facility performs additional monitoring. Any additional monitoring beyond what is required by the permit must also be reported on the DMR as required in the standard requirements section of the permit.

These limits are required during May through September. No changes are recommended to the current recreational period and the required disinfection season.

Effluent Data
The Cadott Wastewater Treatment Facility has monitored effluent *E. coli* from August 2021 to July 2022 and a total of 22 results are available. A geometric mean of 126 counts/100 mL was never exceeded in any of the months, with a maximum monthly geometric mean of 15 counts/100 mL. Effluent data did not exceed 410 counts/100 mL. The maximum reported value was 53 counts/100 mL. Based on this effluent data it appears that the facility can meet new *E. coli* limits and a compliance schedule is not needed in the reissued permit.

PART 5 – PHOSPHORUS

Water Quality-Based Effluent Limits (WQBEL)
Revisions to administrative rules regulating phosphorus took effect on December 1, 2010. These rule revisions include additions to s. NR 102.06, Wis. Adm. Code, which establish phosphorus standards for surface waters. Subchapter III of NR 217, Wis. Adm. Code, establishes procedures for determining WQBELs for phosphorus, based on the applicable standards in ch. NR 102, Wis. Adm. Code.

The conservation of mass equation is described in s. NR 217.13(2)(a), Wis. Adm. Code, for phosphorus WQBELs and includes variables of water quality criterion (WQC), receiving water flow rate (Qs), effluent flow rate (Qe), and upstream phosphorus concentrations (Cs) provided below.

$$\text{Limitation} = [(WQC)(Qs+(1-f)\ Qe) - (Qs-f\ Qe)\ (Cs)]/Qe$$

Where:

WQC = 0.075 mg/L for Yellow River.
Qs = 100% of the 7-Q_2 of 11 cfs
Cs = background concentration of phosphorus in the receiving water pursuant to s. NR 217.13(2)(d), Wis. Adm. Code
Qe = effluent flow rate = 0.167 MGD = 0.258 cfs
f = the fraction of effluent withdrawn from the receiving water = 0

Section NR 217.13(2)(d), Wis. Adm. Code, specifies that the background phosphorus concentration used in the limit calculation formula shall be calculated using the procedures specified in s. NR 102.07(1)(b) to (c), Wis. Adm. Code. The median shall be calculated with at least one year of data using samples collected once per month during the period of May through October. All representative data from the most recent 5 years shall be used, but data from the most recent 10 years may be used if representative of current conditions.

The impaired water listing of the Yellow River points towards the notion that effluent phosphorus limits equal to the water quality criterion are needed to prevent the discharge from contributing to further impairment of the receiving water. *The Guidance for Implementing Wisconsin's Phosphorus Water Quality Standards for Point Source Discharges (2020)* suggests setting effluent limits equal to the criterion in the absence of an EPA approved total maximum daily load for discharges of phosphorus to phosphorus impaired waters.

Effluent Data

The following table summarizes effluent total phosphorus monitoring data from January 2018 to October 2022.

	Phosphorus mg/L
1-day P_{99}	0.66
4-day P_{99}	0.40
30-day P_{99}	0.27
Mean	0.21
Std	0.13
Sample size	759
Range	0.06 - 1.08

Reasonable Potential Determination
This discharge has reasonable potential to cause or contribute to an exceedance of the water quality criterion because the 30-day P_{99} of reported effluent total phosphorus data is greater than the calculated WQBEL**.** Therefore, **a WQBEL is required.**

Limit Expression
According to s. NR 217.14(2), Wis. Adm. Code, because the calculated WQBEL is less than or equal to 0.3 mg/L, the effluent limit of 0.075 mg/L may be expressed as a six-month average. If a concentration limitation expressed as a six-month average is included in the permit, a monthly average concentration limitation of 0.225 mg/L, equal to three times the WQBEL calculated under s. NR 217.13, Wis. Adm. Code shall also be included in the permit. The six-month average should be averaged during the months of May – October and November – April.

Mass Limits
A mass limit is also required, pursuant to s. NR 217.14(1)(a), Wis. Adm. Code, because the discharge is to a surface water that is to or upstream of a phosphorus impaired surface water. **This final mass limit shall be 0.075 mg/L × 8.34 × 0.167 MGD = 0.10 lbs/day expressed as a six-month average.**

Variance Request
The facility has applied for an individual variance under s. 283.15, Wis. Stats. Eligibility for the variance is not included as part of this review. If a variance is granted and approved by US Environmental Protection Agency**, the current interim limit of 0.40 mg/L may be extended.**

PART 6 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

Surface water quality standards for temperature took effect on October 1, 2010. These regulations are detailed in chs. NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. Daily maximum and weekly average temperature criteria are available for the 12 different months of the year depending on the receiving water classification.

In accordance with s. NR 106.53(2)(b), Wis. Adm. Code, the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), Wis. Adm. Code, the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. These values were based off actual flow reported from January 2018 to October 2022.

Attachment #1

Monthly Temperature Limits

Month	Calculated Effluent Limit	
	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	116	120
FEB	NA	120
MAR	92	120
APR	71	120
MAY	82	120
JUN	98	120
JUL	118	120
AUG	NA	120
SEP	NA	120
OCT	95	120
NOV	82	120
DEC	109	120

Reasonable Potential

Permit limits for temperature are recommended based on the procedures in s. NR 106.56, Wis. Adm. Code.

- An acute limit for temperature is recommended for each month in which the representative daily maximum effluent temperature for that month exceeds the acute WQBEL. The representative daily maximum effluent temperature is the greater of the following:
  (a) The highest recorded representative daily maximum effluent temperature
  (b) The projected 99th percentile of all representative daily maximum effluent temperatures
- A sub−lethal limitation for temperature is recommended for each month in which the representative weekly average effluent temperature for that month exceeds the weekly average WQBEL. The representative weekly average effluent temperature is the greater of the following:
  (a) The highest weekly average effluent temperature for the month.
  (b) The projected 99th percentile of all representative weekly average effluent temperatures for the month

Section NR 106.59(2)(b), Wis. Adm. Code, allows the use of temperature effluent data, on a case-by-case basis, from at least two other POTWs within a 100-mile radius that utilize similar wastewater treatment technology and have a similar ratio of domestic to industrial waste stream composition, or representative data of the POTW.

A review of effluent temperature data collected from the Bloomer WWTF, the Stanley WWTF, and the Taylor WWTF indicate it is unlikely that effluent temperatures from the Cadott Wastewater Treatment Facility which operates an activated sludge system and consists primarily of domestic sewage would exceed the calculated effluent temperatures. **Therefore, no temperature limits or monitoring are required in the reissued permit.**

Attachment #1

PART 7 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. Decisions below related to the selection of representative data and the need for WET limits were made according to ss. NR 106.08 and 106.09, Wis. Adm. Code. WET monitoring frequency and toxicity reduction evaluation (TRE) recommendations were made using the best professional judgment of staff familiar with the discharge after consideration of the guidance in the *Whole Effluent Toxicity (WET) Program Guidance Document (2022).*

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC_{50} (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09(2)(b), Wis. Adm Code.

- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC_{25} (Inhibition Concentration) greater than the instream waste concentration (IWC), according to s. NR 106.09(3)(b), Wis. Adm Code. The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC of 17% shown in the WET Checklist summary below was calculated according to the following equation, as specified in s. NR 106.03(6), Wis. Adm Code:

$$IWC\ (as\ \%) = Q_e \div \{(1 - f)\ Q_e + Q_s\} \times 100$$

Where:

Q_e = annual average flow = 0.167 MGD = 0.258 cfs
f = fraction of the Q_e withdrawn from the receiving water = 0
Q_s = ¼ of the 7-Q_{10} = 5.20 cfs ÷ 4 = 1.30 cfs

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), receiving water must be used as the dilution water and primary control in chronic WET tests, unless the use of different dilution water is approved by the Department prior to use. The dilution water used in WET tests conducted on Outfall 003 shall be a grab sample collected from the receiving water location, upstream and out of the influence of the mixing zone and any other known discharge. The specific receiving water location must be specified in the WPDES permit.

- Shown below is a tabulation of all available WET data for Outfall 003. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data, as specified in s. NR 106.08(3), Wis. Adm Code. Data which is not believed to be representative of the discharge was not included in reasonable potential calculations. The table below differentiates between tests used and not used when making WET determinations.

Attachment #1

WET Data History

Date Test Initiated	Acute Results LC_{50} %				Chronic Results IC_{25} %					Footnotes or Comments
	C. dubia	Fathead minnow	Pass or Fail?	Used in RP?	*C. dubia*	Fathead Minnow	Algae (IC_{50})	Pass or Fail?	Use in RP?	
06/17/2014	>100	>100	Pass	Yes	>100	>100		Pass	Yes	

- According to s. NR 106.08, Wis. Adm. Code, WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. **WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.**

  Acute Reasonable Potential = [(TUa effluent) (B)]
  Chronic Reasonable Potential = [(TUc effluent) (B)(IWC)]

  According to s. NR 106.08(6)(d), Wis. Adm. Code, TUa and TUc effluent values are equal to zero whenever toxicity is not detected (i.e. when the LC_{50}, IC_{25} or $IC_{50} \geq 100\%$).

  Acute Reasonable Potential = 0 < 1.0, reasonable potential is not shown, and a limit is not required.

  Chronic Reasonable Potential = 0 < 1.0, reasonable potential is not shown, and a limit is not required.

The WET checklist was developed to help DNR staff make recommendations regarding WET limits, monitoring, and other related permit conditions. The checklist indicates whether acute and chronic WET limits are needed, based on requirements specified in s. NR 106.08, Wis. Adm. Code. The checklist steps the user through a series of questions, assesses points based on the potential for effluent toxicity, and suggests monitoring frequencies based on points accumulated during the checklist analysis. As toxicity potential increases, more points accumulate, and more monitoring is recommended to ensure that toxicity is not occurring. A summary of the WET checklist analysis completed for this permittee is shown in the table below. Staff recommendations based on best professional judgment are provided below the summary table. For guidance related to reasonable potential and the WET checklist, see Chapter 1.3 of the WET Guidance Document: https://dnr.wisconsin.gov/topic/Wastewater/WET.html.

WET Checklist Summary

	Acute	Chronic
AMZ/IWC	Not Applicable. **0 Points**	IWC = 17%. **0 Points**
Historical Data	One test used to calculate RP. No tests within last 5 years. (5 pts) **5 Points**	One test used to calculate RP. No tests within last 5 years. (5 pts) **5 Points**
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. **0 Points**	Same as Acute. **0 Points**

Attachment #1

	Acute	Chronic
Receiving Water Classification	WWSF (5 pts) **5 Points**	Same as Acute. **5 Points**
Chemical-Specific Data	No reasonable potential for limits based on ATC; Ammonia, Arsenic, Chloride, Copper, Zinc detected. (3 pts) Additional Compounds of Concern: None **3 Points**	No reasonable potential for limits based on CTC; Ammonia, Arsenic, Chloride, Copper, Zinc detected. (3 pts) Additional Compounds of Concern: None **3 Points**
Additives	One Water Quality Conditioner added. (1 pt) Permittee does not have P chemical SOPs in place (15 pts) **16 Points**	Additive used more than once per 4 days. **16 Points**
Discharge Category	No Industrial Contributors. **0 Points**	Same as Acute. **0 Points**
Wastewater Treatment	Secondary or Better **0 Points**	Same as Acute. **0 Points**
Downstream Impacts	No impacts known **0 Points**	Same as Acute. **0 Points**
Total Checklist Points:	**29 Points**	**29 Points**
Recommended Monitoring Frequency (from Checklist):	3 tests during permit term	3 tests during permit term
Limit Required?	No	No
TRE Recommended? (from Checklist)	No	No

- After consideration of the guidance provided in the Department's WET Program Guidance Document (2022) and other information described above, three acute and three chronic WET tests are recommended in the reissued permit. Tests should be done in rotating quarters to collect seasonal information about this discharge. WET testing should continue after the permit expiration date (until the permit is reissued).

Ammonia Nitrogen Calculations from the November 30, 2016 WQBEL Memo

AMMONIA (as N) LIMITS				
Effluent Flow (mgd):	0.167			
Effluent Flow (cfs):	0.258			
Effluent pH data:				
Begin Date	01-Jun-13			
End Date	31-May-16			
# of Samples	1096			
Maximum	7.4			
Average	7.04			
Standard Deviation	0.140			
Estimated 99th Percentile	7.37			
Max. Effluent pH (s.u.):	7.40			
BACKGROUND INFORMATION:				
	summer	***winter***	***spring***	***fall***
4Q3 (cfs)				
7Q10 (cfs)	5.2	5.2		
30Q5 (cfs)	9.35	9.35		
7Q2 (cfs)	11	11		
Ammonia (mg/L) (1)	0.1	0.1		
Temperature (deg C) (2)	25	3		
pH (std. units) (3)	7.6	7.5		
% of river flow used:	100	25		
Reference weekly flow:	5.2	1.3		
Reference monthly flow:	9.4	2.3		
CRITERIA (in mg/L):				
Acute (@ effl. pH):	22.97	22.97		
4-day Chronic (@ backgrd. pH):				
early life stages present	5.06	10.91		
early life stages absent	5.06	17.71		
30-day Chronic (@ backgrd. pH)				
early life stages present	2.02	4.36		
early life stages absent	2.02	7.09		
EFFLUENT LIMITS (in mg/L):				
Daily maximum	46	46		
Weekly average				
early life stages present	105	65		
early life stages absent		106		
Monthly average				
early life stages present	72	43		
early life stages absent		70		

(1) Yellow River Data
(2) Default Data
(3) Yellow River Data

Attachment #3

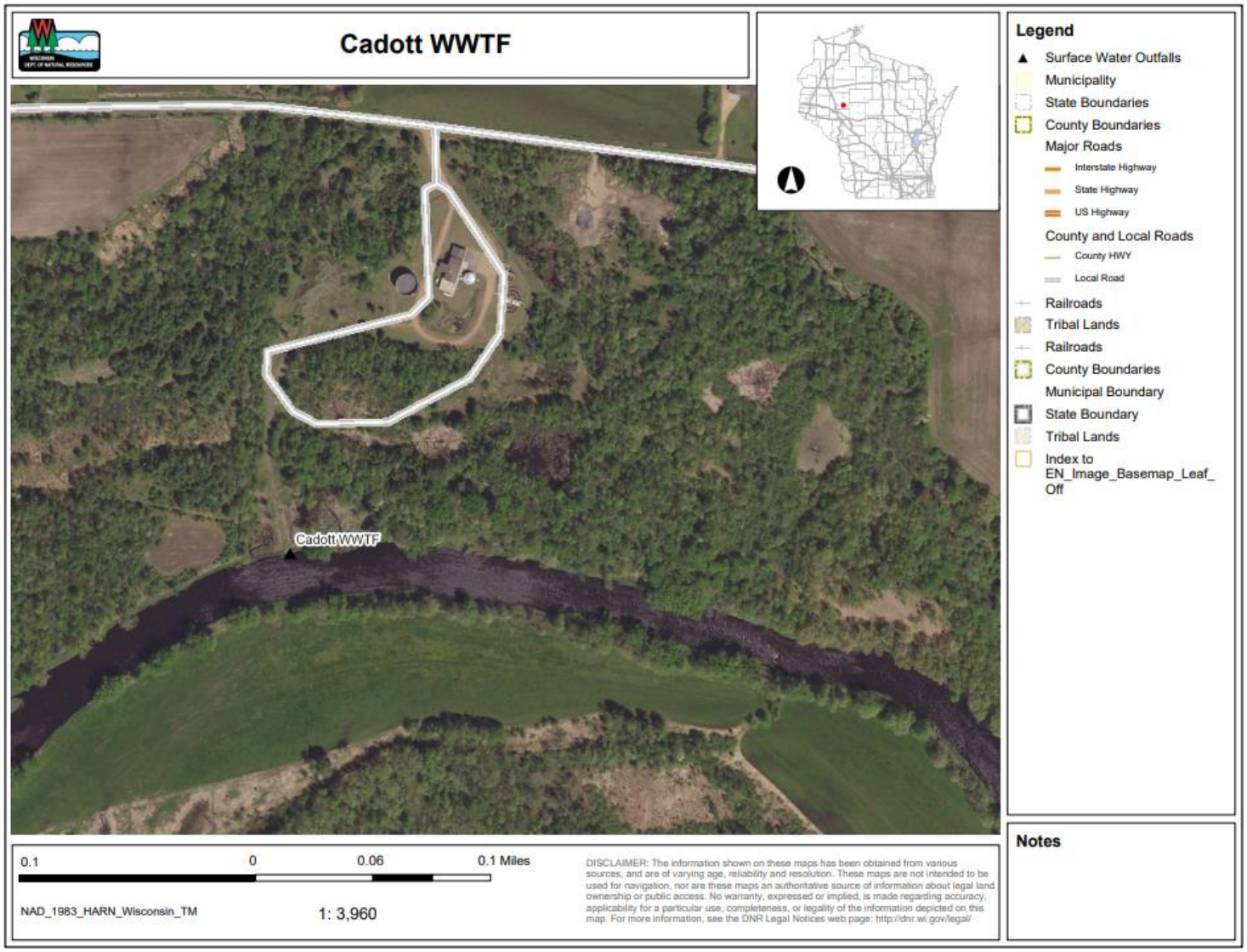
Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

						Temp Dates	Flow Dates
Facility:	Cadott WWTF		**7-Q_{10}:**	5.20	cfs		
Outfall(s):	003		**Dilution:**	25%		**Start:** N/A	01/01/18
Date Prepared:	11/14/2022		**f:**	0		**End:** N/A	10/31/22
Design Flow (Qe):	0.167	MGD	**Stream type:**	Small warm water sport or forage fish community			
Storm Sewer Dist.	0	ft	**Qs:Qe ratio:**	5.0	:1		
			Calculation Needed?	YES			

Month	Water Quality Criteria			Receiving Water Flow Rate (Qs)	Representative Highest Effluent Flow Rate (Qe)		f	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Ta (default)	Sub-Lethal WQC	Acute WQC		7-day Rolling Average (Qesl)	Daily Maximum Flow Rate (Qea)		Weekly Average	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(cfs)	(MGD)	(MGD)		(°F)	(°F)	(°F)	(°F)
JAN	33	49	76	1.30	0.201	0.211	0			116	120
FEB	34	50	76	1.30	0.169	0.213	0			NA	120
MAR	38	52	77	1.30	0.292	0.376	0			92	120
APR	48	55	79	1.30	0.360	0.397	0			71	120
MAY	58	65	82	1.30	0.344	0.388	0			82	120
JUN	66	76	84	1.30	0.376	0.418	0			98	120
JUL	69	81	85	1.30	0.271	0.345	0			118	120
AUG	67	81	84	1.30	0.224	0.298	0			NA	120
SEP	60	73	82	1.30	0.208	0.322	0			NA	120
OCT	50	61	80	1.30	0.271	0.327	0			95	120
NOV	40	49	77	1.30	0.231	0.245	0			82	120
DEC	35	49	76	1.30	0.197	0.276	0			109	120

Attachment #4



Facility Specific Phosphorus Variance Data Sheet

Directions: Please complete this form electronically. Record information in the space provided. Select checkboxes by double clicking on them. Do not delete or alter any fields. For citations, include page number and section if applicable. Please ensure that all data requested are included and as complete as possible. Attach additional sheets if needed.

Section I: General Information

A. Name of Permittee: Village of Cadott

B. Facility Name: Cadott Wastewater Treatment Facility

C. Submitted by: Wisconsin Department of Natural Resources

D. State: Wisconsin **Substance:** Phosphorus **Date completed:** 4/8/2024

E. Permit #: 0023515-10-0 **WQSTS #:** (EPA USE ONLY)

F. Duration of Variance **Start Date:** October 1, 2024 **End Date:** September 30, 2029

G. Date of Variance Application: October 26, 2022

H. Is this permit a:
☒ **First time submittal for variance**
☐ **Renewal of a previous submittal for variance** *(Complete Section X)*

I. Description of proposed variance:

The Village of Cadott has applied for a variance from the total phosphorus water quality standard found in s NR 102.06, Wis. Adm. Code, of 0.075mg/L for the Yellow River. The water quality based effluent limits (WQBELs) calculated pursuant to s. NR 217.13, Wis. Adm. Code, are 0.225 mg/L as a monthly average and 0.075 mg/L as six-month averages.

The effluent phosphorus concentration for this discharge is 0.27 mg/L (30-day 99th percentile) from January 2018 – October 2022. During the current permit term, the interim phosphorus limit was 0.4mg/L – MDV.

J. List of all who assisted in the compilation of data for this form

Name	Email	Phone	Contribution
Victoria Ziegler	Victoria.ziegler@wisconsin.gov	414-391-8946	Permit Drafter
Logan Rubeck	Logan.Rubeck@wisconsin.gov		Compliance Engineer
Ben Hartenbower	Benjamin.Hartenbower@wisconsin.gov	715-225-4705	Parts II D-H and K-N, III G-H

Section II: Criteria and Variance Information

A. Water Quality Standard from which variance is sought: Phosphorus 0.075 mg/l

B. List other criteria likely to be affected by variance: none

C. Source of Substance:

The Village of Cadott discharges to the Yellow River located in the Lotz-Creek Yellow River Watershed. According to the Pollutant Load Ratio Estimation Tool (PRESTO) model, 97% of the phosphorus in the 363.55 square mile watershed entering the Yellow River is attributable from nonpoint sources. The total annual average nonpoint phosphorus loading is 32,999 lbs/year. The Village of Cadott's average annual phosphorus loading between 2010 and 2012 was 271 lbs/year. (See PRESTO report)

Citation: PRESTO is a statewide GIS-based tool that compares the average annual phosphorus loads originating from point and nonpoint sources within a watershed. More information about this model is available at http://dnr.wi.gov/topic/surfacewater/presto.html.

D. Ambient Substance Concentration: 0.100 mg/L ☒ **Measured** ☐ **Estimated** ☐ **Default** ☐ **Unknown**

E. If measured or estimated, what was the basis? Include citation.

The ambient concentration of 0.100 mg/L is the median phosphorus concentration for 21 samples collected during May and October from 6/12/2018 to 10/30/2021 in the Yellow River at Station 093095 (HWY XX)

F. Average effluent discharge rate: 0.171 MGD **Maximum effluent discharge rate:** 0.4179 MGD (6/16/2020)
January 2018 – October 2022

G. Effluent Substance Concentration: Mean = 0.21 mg/L, 1-day P99 = 0.66 mg/L, 4-day P99 = 0.40 mg/L, 30-day P99 = 0.27 mg/L
☒ **Measured** ☐ **Estimated** ☐ **Default** ☐ **Unknown**

H. If measured or estimated, what was the basis? Include Citation. Effluent data reported during January 2018 – October 2022 (n = 759).

I. Type of HAC:
☐ **Type 1: HAC reflects waterbody/receiving water conditions**
☐ **Type 2: HAC reflects achievable effluent conditions**
☒ **Type 3: HAC reflects current effluent conditions**

J. Statement of HAC:
The Department has determined the highest attainable condition of the receiving water is achieved through the application of the variance limit in the permit, combined with a permit requirement that the permittee implement its phosphorus PMP. Thus, the HAC at the commencement of this variance is 0.4 mg/L, which reflects the greatest phosphorus reduction achievable with the current treatment process, in conjunction with the implementation of the permittee's phosphorus PMP. The current effluent condition is reflective of on-site optimization measures that have already occurred. This HAC determination is based on the economic feasibility of available compliance options for Cadott at this time (See Economic Section below). The permittee may seek to renew this variance in the subsequent reissuance of this permit; the Department will reevaluate the HAC in its review of such a request. A subsequent HAC cannot be defined as less stringent that this HAC.

K. Variance Limit : 0.40 mg/L monthly average

L. Level currently achievable (LCA): 0.40 mg/L monthly average

M. What data were used to calculate the LCA, and how was the LCA derived? (*Immediate compliance with LCA is required.)*
The LCA was based on best professional judgment after reviewing monthly average effluent data from January 2018 – October 2022. The highest reported monthly average during that period was 1.08 mg/L.

N. Explain the basis used to determine the variance limit (which must be ≤ LCA). Include citation.
Data from January 2018 – October 2022 were evaluated as the basis for determining the interim limit. The 30-day P99 of these data was 0.27 mg/L. This value was not chosen as an interim limit because the monthly average exceeded this value 28% of the time. As an alternate approach, 99th percentile of the monthly averages was evaluated. This analysis resulted in a value of 0.42 mg/L, and the highest reported monthly average value during this period was 0.43 mg/L, therefore a slightly lower interim limit of 0.40 mg/L, equal to the current interim limit was recommended.

O. Select all factors applicable as the basis for the variance provided under 40 CFR 131.10(g). Summarize justification below: ☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☒ **6**

The Cadott WWTF currently reduces phosphorus in effluent with chemical and biological treatment during the current permit term, the permittee evaluated compliance options and determined that all operations will cause economic hardship on the community.

Citation: Progress Report No. 4.

Section III: Location Information

A. Counties in which water quality is potentially impacted: Chippewa County

B. Receiving waterbody at discharge point: Yellow River

C. Flows into which stream/river? Wissota Lake which flows into Chippewa Flowage **How many miles downstream?** **~8 miles**

D. Coordinates of discharge point (UTM or Lat/Long): Lat: 44.95582 N Long: 91.13611 W

E. What are the designated uses associated with this waterbody?
Fish and aquatic life (default)

F. Describe downstream waters:
The Yellow River is a warm water sport fish community and is a non-public water supply. The Yellow River empties into Lake Wissota which drains into the Chippewa Flowage. The Yellow River and Lake Wissota are impaired with total phosphorus.

G. What is the distance from the point of discharge to the point downstream where the concentration of the substance falls to less than or equal to the applicable criterion of the substance?
Less than 15 miles.

H. Provide the equation used to calculate that distance.
The applicable water quality criterion for the Chippewa River, below the confluence with the Yellow River and downstream of Lake Wissota is 0.100 mg/L. Data collected from the Chippewa River indicate that this criterion is being met.

I. Identify all other variance permittees for the same substance which discharge to the same stream, river, or waterbody in a location where the effects of the combined variances would have an additive effect on the waterbody:
There are no other permittees that discharge to the Yellow River that have a phosphorus variance.
The Village of Gilman discharges to a wetland tributary and then to the Yellow River in Taylor County which is upstream of Cadott.

Please attach a map, photographs, or a simple schematic showing the location of the discharge point as well as all variances for the substance currently draining to this waterbody on a separate sheet.

J. Is the receiving waterbody on the CWA 303(d) list? If yes, please list the impairments below. ☐ Yes ☒ No ☐ Unknown

River Mile	Pollutant	Impairment
0.00 – 45.42	Total Phosphorus	Unknown

Section IV: Pretreatment (complete this section only for POTWs with DNR-Approved Pretreatment Programs. See w:\Variances\Templates and Guidance\Pretreatment Programs.docx)

A. Are there any industrial users contributing phosphorus to the POTW? If so, please list.
None.

B. Are all industrial users in compliance with local pretreatment limits for phosphorus? If not, please include a list of industrial users that are not complying with local limits and include any relevant correspondence between the POTW and the industry (NOVs, industrial SRM updates and timeframe, etc)
N/A

C. When were local pretreatment limits for phosphorus last calculated?
N/A

D. Please provide information on specific SRM activities that will be implemented during the permit term to reduce the industry's discharge of the variance pollutant to the POTW
N/A

Educating residential users on composting food waste, encouraging clean-up of pet waste and levaes, and discouraging the use of phosphorus based products like soaps. Review all commercial customers in the service area and determine if there are specific business who may have a significant contribution. Sampling of water supply and influent sampling location. Reduction of I and I .

Section V: Public Notice Drafter

A. Has a public notice been given for this proposed variance? ☒ Yes ☐ No

B. If yes, was a public hearing held as well? ☒ Yes ☐ No ☐ N/A

C. What type of notice was given?

☒ **Notice of variance included in notice for permit** ☐ **Separate notice of variance**

D. Date of public notice: _____ **Date of hearing:** _____

E. Were comments received from the public in regards to this notice or hearing? ☐ **Yes** ☐ **No**
(If yes, please attach on a separate sheet)

Section VI: Human Health

A. Is the receiving water designated as a Public Water Supply? ☐ **Yes** ☒ **No**

B. Applicable criteria affected by variance: N/A?

C. Identify any expected impacts that the variance may have upon human health, and include any citations: None.

Section VII: Aquatic Life and Environmental Impact

A. Aquatic life use designation of receiving water: Fish and Aquatic Life (Default)

B. Applicable criteria affected by variance: Phosphorus 0.075mg/L

C. Identify any environmental impacts to aquatic life expected to occur with this variance, and include any citations:
The Village of Cadott discharges to the Yellow River located in the Lotz-Creek Yellow River Watershed. According to the Pollutant Load Ratio Estimation Tool (PRESTO) model, 97% of the phosphorus in the 363.55 square mile watershed entering the Yellow River is attributable from nonpoint sources. The total annual average nonpoint phosphorus loading is 32,999 lbs/year. The Village of Cadott's average annual phosphorus loading between 2010 and 2012 was 271 lbs/year. (See PRESTO report)

D. List any Endangered or Threatened species known or likely to occur within the affected area, and include any citations:

Speckled Rangeland Grasshopper (Arphia conspersa) (T)
Prairie Skink (Plestiodon septentrionalis) (T)
Confusing Bumble Bee (Bombus perplexus) (T)
Yellow Bumble Bee (Bombus terricla) (T)

Source: https://dnr.wisconsin.gov/topic/NHI

Section VIII: Economic Impact and Feasibility

A. Describe the permittee's current pollutant control technologies (treatment processes):
Village of Cadott currently utilizes aluminum sulfate (alum) to achieve chemical phosphorus removal. In 2013 the Village of Cadott completed a facility upgraded which included operators to feed chemical for phosphorus removal directly to the flow of waste activated sludge before entered the aerobic digesters. One selector basis in provided upstream of an oxidation ditch to achieve biological phosphorus removal. Three chemical addition points can be used to dose aluminum sulfate to the process for chemical precipitation.

B. **What modifications would be necessary to comply with the current limits? List additional treatment processes and/or technologies available. Include any citations.**

Tertiary treatment such as reverse osmosis, disc filter, or other equivalent technologies.

Citation: Individual Phosphorus Variance Application - October 2022 (Cedar Corporation)

C. Identify any expected environmental impacts that would result from further treatment, and include any citations:

D. Is it technically and economically feasible for this permittee to modify the treatment process to comply with the water quality-based limits? ☐ **Yes** ☒ **No**

E. If treatment is possible, is it possible to comply with the limits on the substance? ☒ Yes ☐ No

Tertiary treatment at municipal treatment plants has proven performance across the state in meeting the 0.075 mg/L water quality based effluent limit.

F. If yes, what prevents this from being done? Include any citations.

All evaluated compliance options are economically infeasible at this time because of the cost and the small existing user base would result in a user rate above the 2% primary screener threshold.

Citation: Annual report No 4 and Individual Phosphorus Variance Application - October 2022 (Cedar Corporation)

G. List any alternatives to current practices that have been considered, and why they have been rejected as a course of action, including any citations:

1. Increase chemical feed rate; expected to be non-cost effective
2. Utilize chemical feed at outlet of flow equalization tank; in order to ensure the existing biological phosphorus removal process continues functions as efficiently as possible, utilization of chemical feed at outlet of flow equalization tank is not recommended.
3. Utilize chemical feed at WAS piping upstream of digesters; current effluent data indicates the WWTF has been achieving adequate phosphorus removal without chemical additional to WAS
4. Change chemical used for phosphorus; rare-earth products maybe be 5-10 times as expensive as alum; jar testing completed and determined alum was the most effective coagulant
5. Tertiary sand filter system would result in a user rate increase of 3.29%

Citation: Annual report No 4 and Individual Phosphorus Variance Application - October 2022 (Cedar Corporation)

H. Describe the economic impacts of compliance: ***{applies only to municipalities; include other cost estimates for industries}***

The Village of Cadott is composed of 554 households. The cost of the tertiary mechanical treatment upgrade would cost $4,040,000 and the annual operational costs would be $30,000. Current residential sewer user rates are $958.15 annually. The increase in costs to install and operate a tertiary sand filter system ($423.03) would increase the average sewer utility fee to $1,381.21 per year. The Village is unable to absorb the additional financial burden of an upgrade at this time. The economic impact of construction and maintained compliance for the tertiary sand filter system would result in a user rate charge of 3.18% which would be higher than 2% of the MHI.

Note: The numbers submitted by Cedar Corporation were adjusted by the DNR to account for the 10% non-residential users.

Economic Factor		Source
MHI	43,409.00	IPV Application
Calculated preliminary screener	3.18%	IPV Application – Cedar Cooperation Number adjusted by DNR
Secondary score value		

Section IX: Multi-Discharger Variance Feasibility *(this assumes MDV approval)*

A. Does the facility meet the economic indicators to qualify for the MDV? ☒ Yes ☐ No ☐ Unknown

MDV secondary indicator score: **6**

B. Is it technically and economically feasible for this permittee to comply with a phosphorus WQBEL of 1 mg/L or lower? ☒ Yes ☐ No ☐ Unknown

C. Justification for considering an individual variance in lieu of the MDV:

The facility discharges below target value and therefore no MDV County payments are made.

Section X: Compliance with Water Quality Standards

A. Describe all activities that have been, and are being, conducted to reduce the discharge of the substance into the receiving stream. This may include existing treatments and controls, consumer education, promising centralized or remote treatment technologies, planned research, etc. Include any citations.

- Reviewed users and reaffirmed there are no commercial and industrial users to survey.
- Contacted local schools, restaurants, and car washes to educate them about using phosphorus free cleaning products.
- Ensure that no phosphorus is added to the municipal water supply.
- Optimized the location of alum addition to the treatment plant through a trial and error process evaluating three possible addition points.
- Ceased decanting from the sludge storage tank due to high phosphorus levels returning to the headworks of the plant.
- Evaluated side stream phosphorus concentrations to ensure that phosphorus was being sequestered in the biosolids.
- Do not accept holding tank or septage waste.
- Optimized Bio-P removal through the use of an upstream mixing tank and DO control in the oxidation ditch.

Citation: Year 5 Annual Phosphorus Progress Report

B. Describe all actions that the permit requires the permittee to complete during the variance period to ensure reasonable progress towards attainment of the water quality standard. Include any citations.

From subsection 2.2.1.2 Phosphorus Variance of Cadott's Draft Permit:

This permit contains a variance to the water quality-based effluent limit (WQBEL) for phosphorus approved in accordance with s. 283.15, Wis. Stats. As conditions of this variance the permittee shall (a) maintain effluent quality at or below the interim effluent limitation specified in the table above, (b) implement the phosphorus pollutant minimization measures specified in the Pollutant Minimization Program (PMP) Plan dated October 22, 2022 and (c) perform the actions listed in the schedule section of the permit (See the Schedules section herein).

Annual Phosphorus Progress Report: 01/31/2025

Annual Phosphorus Progress Report #2: 01/31/2026

Annual Phosphorus Progress Report #3: 01/31/2027

Final Phosphorus Report: 01/31/2028

Section XI: Compliance with Previous Permit *(Variance Reissuances Only)*

A.	**Date of previous submittal:** N/A	**Date of EPA Approval:**	
B.	**Previous Permit #:**	**Previous WQSTS #:**	(EPA USE ONLY)
C.	**Effluent substance concentration:**	**Variance Limit:**	
D.	**Target Value(s):**	**Achieved?**	☐ **Yes** ☐ **No** ☐ **Partial**

E. For renewals, list previous steps that were to be completed. Show whether these steps have been completed in compliance with the terms of the previous variance permit. Attach additional sheets if necessary.

Condition of Previous Variance	Compliance
N/A	☐ **Yes** ☐ **No**

VILLAGE OF CADOTT
CHIPPEWA COUNTY, WISCONSIN

PHOSPHORUS POLLUTANT MINIMIZATION PLAN

OCTOBER 2022

604 WILSON AVE.
MENOMONIE, WI 54751

PROJECT NO. C4501-0063

PHOSPHORUS POLLUTANT MINIMIZATION PLAN

OCTOBER 2022

PREPARED FOR:

VILLAGE OF CADOTT
CHIPPEWA COUNTY, WISCONSIN

PREPARED BY:

CEDAR CORPORATION
604 WILSON AVENUE
MENOMONIE, WI 54751
715-235-9081
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PROJECT NO. C4501-0063

CONTENTS

1 INTRODUCTION

This document is a Pollutant Minimization Plan (PMP) for the Village of Cadott's wastewater treatment plant (WWTP). The PMP is a requirement for an Individual Phosphorus Variance (IPV) application, of which the Village intends to pursue. The PMP will describe actions to be taken by the Village during the forthcoming WPDES permit term to minimize the quantity of phosphorus discharged from the WWTP.

The current WPDES permit number for the Village's WWTP is WI-0023515-09-0. The Village's final calculated effluent phosphorus limitations are 0.075 mg/L and 0.11 lbs./day, expressed as annual averages. The Village has operated under a multi-discharger variance (MDV) for the current permit, which allow effluent phosphorus discharge to a limit of 0.4 mg/L. The MDV will not be renewed for the forthcoming WPDES permit term.

The Village has worked towards optimizing the existing WWTP for phosphorus removal over the past five-year permit term, but cannot meet the final limits without a major facility upgrade. The upgrade would likely consist of a tertiary filtration process designed to achieve low-level phosphorus removal, and would cause significant economic impacts for the Village's sewer users.

If approved, the IPV will allow an alternative phosphorus discharge limit for the forthcoming WPDES permit term, anticipated to be effective through at least 2027. Throughout the permit term, the Village will follow the actions described in the PMP and plan to comply with the final phosphorus limits by reducing non-point phosphorus runoff in their watershed.

This PMP will address the following actions to be taken by the Village:

- Source Reduction
- In-Plant Optimization
- Water Quality Trading (Scoping and Project Establishment)
- Financial and Capacity Building

As a requirement of the IPV, the Village expects to provide annual updates regarding meeting the objectives outlined in the PMP. A proposed schedule for implementing the actions described in the PMP is presented at the end of this document.

2 RESIDENTIAL INFLUENT / SOURCE REDUCTION

2.1 Residential Phosphorus Reduction

All influent wastewater to the Village's WWTP is believed to be domestic strength, without abnormally high phosphorus quantities. Most users within the service area are residents of the Village. No septic or waste hauling companies utilize the WWTP for final disposal.

It is possible that some influent phosphorus reduction can be achieved by educating users of the service area about techniques for limiting phosphorus inputs to sewer. These may include composting food waste, encouraging clean-up of pet waste and leaves, and discouraging the use of phosphorus-based products such as soaps. As part of the PMP, the Village will plan to provide residents with information on how to reduce their phosphorus contribution to wastewater.

2.2 Commercial Phosphorus Reduction

Commercial users consist of bars, restaurants, offices, banks, and other business which are not likely discharging significant phosphorus. There are no industries in the Village suspected of producing high-strength wastewater.

As part of the PMP, the Village will review all commercial customers in the service area and determine if there are specific business who may have significant phosphorus contribution.

2.3 Phosphorus Sampling

The Village has not completed any prior testing of phosphorus quantities for the drinking water system. No polyphosphate is used for the treatment of drinking water before being sent to the distribution system, so elevated phosphorus levels are not expected. The Village will complete sampling of the water supply during the first year of the PMP such that an average phosphorus concentration can be quantified.

Additionally, the Village will conduct a sampling effort for total phosphorus at the existing WWTP influent sampling location. This effort will be completed during the first year of the PMP and will quantify the average phosphorus concentration of water entering the WWTP. If the samples indicate phosphorus levels are greater than expected for domestic-strength wastewater, the Village will investigate to determine the source of the high loadings.

The results of the water system and influent wastewater phosphorus sampling will be documented as part of the PMP.

2.4 Infiltration and Inflow Reduction

The Village is continuously working to address infiltration and inflow (I/I) in their collection system and completes annual jetting of pipelines and televising of suspected regions. Approximately 10% of the collection system is televised and 50% of manholes are visually inspected annually. Susceptible areas are prioritized for repairs or replacement as budget allows.

The Village will continue to follow the collection system management and I/I reduction practices outlined in their Capacity, Management, Operation, and Maintenance (CMOM) program during the IPV permit term. As susceptible areas are identified, projects will be completed to reduce the impacts of potential I/I from entering the collection system.

Completion of these projects would be expected to reduce flow rates to the WWTP during wet weather conditions and would subsequently be expected to reduce the mass of phosphorus discharged from the WWTP.

3 IN-PLANT OPTIMIZATION

3.1 Description of Existing WWTP

Wastewater from the Village's collection system flows by gravity to a lift station located at the site of the Village's original wastewater treatment plant. At the lift station, wastewater is screened prior to being pumped to the current WWTP site. The lift station also includes the Village's influent sampler and influent flow meter.

Upon entering the WWTP site, raw wastewater is fed to the flow equalization tank. The inlet of this basin is a small, narrow channel designed to promote sedimentation of grit from the Village's wastewater. Additionally, return activated sludge (RAS) from the final clarifier is pumped to the equalization tank upstream of the grit channel. The combined mixture of RAS and raw wastewater is commonly referred to as "mixed liquor."

The equalization tank acts as the anaerobic "zone" required for biological phosphorus removal, where phosphorus release occurs in the absence of oxygen and nitrate. Mixed liquor is retained in the equalization tank for approximately 3 to 4 hours at design average conditions before flowing by gravity to the oxidation ditch. If desired, the Village can add chemical for phosphorus removal to mixed liquor at the outlet of the equalization tank before flowing to the oxidation ditch.

In the oxidation ditch, air is added to the mixed liquor and phosphorus is taken up by microorganisms, in addition to other nutrients. Aerobic phosphorus uptake is currently the primary mechanism for phosphorus removal used by the WWTP. Additionally, the chemical feed system can also be configured to provide chemical to the mixed liquor at the oxidation ditch outlet prior to flowing to the final clarifier. No other phosphorus treatment processes for the forward wastewater flow stream are provided between the final clarifier and the outfall for the WWTP.

Additionally, the WWTP includes two aerobic digesters used for sludge stabilization prior to liquid sludge storage. In the 2013 upgrade, a provision was included to allow the operators to feed chemical for phosphorus removal directly to the flow of waste activated sludge (WAS) before entering the aerobic digesters. WAS is a daily sidestream flow separated from RAS, which is required in order to prevent an excessive build-up of sludge within the equalization tank, oxidation ditch, and final clarifier. In WWTPs performing biological phosphorus removal, supernatant from sludge digestion and thickening processes is often a suspected internal source of high phosphorus loadings. As of December 2021, the Village has never utilized the capability to add phosphorus removal chemical to the WAS stream.

3.2 Description of Existing Chemical Feed System

The Village currently utilizes aluminum sulfate (alum) to achieve chemical phosphorus removal when necessary. Alum is stored in a 4,700 gallon polyethylene storage tank, located in the WWTP storage building. Based on design chemical usage estimates, the storage tank can provide approximately 54 days of storage at peak usage rates.

Two diaphragm-type pumps are provided to administer chemical to various locations throughout the WWTP. The pumps can operate over a range of 0.05 gallons per hour (gph) to 11.1 gph, or 1.2 gallons per day (gpd) to 266 gpd. The pumps have been sized such that only one chemical pump is required at a given time to meet projected treatment needs. Therefore, one pump will always be available as a stand-by unit while the other is operating.

Process piping is currently provided to administer chemical to one of three locations within the WWTP, as stated below:

- Drip-feed into the outlet box of the flow equalization tank.
- Drip-feed into the outlet box of the oxidation ditch.
- Direct injection into pressurized piping for WAS feed into the aerobic digesters.

3.3 Optimization Techniques to Study during PMP

The Village's history of optimization of the existing biological and chemical phosphorus removal processes was described in the December 2021 Optimization Report – Progress Report No. 4. This report concluded that phosphorus removal at the WWTP was likely optimized as well as possible, based on effluent phosphorus data. The WWTP was not designed to produce effluent phosphorus below 0.1 mg/L.

Progress Report No. 4 presented data showing that during warmer weather periods, effluent phosphorus below 0.2 mg/L can be consistently achieved with a combination of biological and chemical means. In the cold weather months with lower temperatures, phosphorus removal efficiency decreases. Given that biological and chemical phosphorus removal processes are temperature dependent, this observation is not unexpected.

The Village will complete the following actions as part of the PMP to verify that the existing WWTP is optimized as well as possible for phosphorus removal:

3.3.1 Vary Chemical Feed Rate at Outlet of Oxidation Ditch

The WWTP operators currently vary feed rate of alum between 3 gallons per day and 12 gallons per day to the outlet of the oxidation ditch, depending on seasonal conditions and the quality of plant effluent. Modifications to alum dosing rate are evaluated on a weekly basis. This strategy currently appears to be effective at maintaining low phosphorus discharges and compliance with the Village's current WPDES permit.

Addition of alum at the oxidation ditch beyond the estimated maximum rate of 12 gallons per day may allow for additional phosphorus removal beyond historical averages, but this is not believed to be a cost-effective approach based on typical effluent phosphorus levels. It is well-understood that chemical addition for phosphorus removal can lose cost-effectiveness beyond a certain point, where significantly higher doses of chemical are required to achieve a minor degree of additional removal. Additionally, alum is understood to impact the pH of wastewater, and over-saturation of alum may reduce pH to the point where is lower than the acceptable discharge range of 6.0 and 9.0, per the Village's WPDES permit.

The Village will continue the current alum addition strategy during the IPV term to maintain phosphorus discharges as low as possible.

3.3.2 Utilize Chemical Feed at WAS Piping Upstream of Digesters

During construction of the WWTP, chemical feed piping was provided to inject phosphorus-removal chemical directly into the pipeline that transfers waste activated sludge (WAS) between the final clarifier and aerobic digesters. In a properly functioning biological phosphorus removal WWTP, the WAS stream is expected to contain a high quantity of phosphorus because it is concentrated in the sludge being disposed of.

By adding chemical to this stream, there is expectation that additional phosphorus precipitation and removal will occur in the digesters. In the absence of supplemental chemical feed, the decant or supernatant return flow from the solids handling processes is expected to contain concentrated quantities of phosphorus that may cause slug loading or disrupt established biology. It is expected that chemical addition to WAS would reduce internal treatment plant recycling of phosphorus and possibly decrease the concentration of phosphorus discharged in effluent.

The Village operators have reported that the WAS chemical feed addition point is not routinely used. All required piping, and valves are already in place for this feed point to be used. However, the Village does not have any way to automate the chemical feed such that chemical addition can occur concurrently when WAS is actively flowing through the pipeline.

The Village will evaluate adding alum to the WAS stream as part of implementing the PMP to determine if this is an effective strategy for reducing phosphorus below the historical observed levels. The existing alum connection to WAS pipeline may be used for this testing, or a temporary chemical feed line adding directly to the digesters may be used.

Chemical addition to WAS will be tested independently and separately from the strategy described in Section 3.3.1 to verify effectiveness and cause. This effort will include sampling of the digester decant flow stream to quantify the concentration of phosphorus. The sampling data will be used to determine the initial chemical dose to the WAS stream.

3.3.3 Consider Alternative Chemical

As stated previously, the Village WWTP was designed to utilize aluminum sulfate (alum) as the intended chemical for chemical phosphorus removal. Other coagulants, such as ferric chloride, poly-aluminum chloride (PAC), and rare-earth based products can also be used to achieve low effluent phosphorus levels. These products vary in terms of cost, effectiveness, and chemical properties and may impact other aspects of the WWTP besides phosphorus removal, if used.

Jar testing was completed on-site at the WWTP in March 2022 by the Village's chemical vendor. According to the results of this study, the phosphorus removal efficiency which can be achieved by alum can be matched using a smaller dose of a poly-aluminum chloride-based product. The Village will review the cost-effectiveness of the poly-aluminum chloride chemical as part of the PMP and compare this to effluent phosphorus data obtained as the other optimization strategies are tested. Following this evaluation, the Village may consider switching to the poly-aluminum chloride permanently if it is a cost-effective and practical way to reduce phosphorus discharges.

4 WATER QUALITY TRADING

4.1 General

In lieu of completing a mechanical WWTP upgrade, the Village will investigate the feasibility of water quality trading (WQT) during the course of the IPV permit term. This evaluation will determine if a cost-effective, non-point phosphorus reduction project can be completed in the Village's watershed which would be capable of generating sufficient phosphorus trading credits for the Village to comply with the final phosphorus limits. The Village would intend to utilize WQT for long-term compliance with the final phosphorus limits if plant optimization is not successful.

If feasible, the WQT project(s) would be constructed and maintained on a long-term basis by the Village. The credits generated from these projects, and the continued operation of the WWTP to current standards, would comply with the limits and eliminate the need for future variances.

As of October 2022, the Village has not begun investigating the feasibility of WQT in their watershed or other applicable watersheds to generate trading credits. The proposed timeline for implementing WQT practices, such that they would be ready to generate credits at the conclusion of the IPV term, is described below.

4.2 Quantification of Credits

The Village will quantify the expected number of phosphorus trading credits and watershed phosphorus reduction needed to comply with the final phosphorus limits during the first year of the IPV, while evaluating in-plant optimization.

The basis for this quantification and expected number of credits needed will be presented in the first PMP annual report update. At this time, we estimate at least 103 lbs./year of credits will be required for compliance.

4.3 Identify Potential WQT Projects and Meet with County LCD

The Village will identify the extents of the watersheds for which applicable WQT projects can be constructed to generate credits. Potential trading partners will be identified in the watersheds based on GIS maps, contour information, soils information, and on-site visits. The Village will prioritize projects that are located upstream of the WWTP discharge and are within the Village's HUC-12 watershed.

Once several projects have been identified, the Village will meet with Chippewa County Land Conservation Department (LCD) staff to discuss the feasibility of implementation. The discussions with LCD will include gauging landowner interest in the project, the purpose of the proposed

trading practice, and review of site conditions. Landowners for the potential project sites are expected to be involved with these meetings, which are anticipated to begin occurring during the second year of the PMP.

4.4 Site-Specific Survey and Testing

Following discussions with County LCD, the Village will complete soil surveys for the proposed project locations to verify phosphorus soil content and the expected phosphorus reduction and trading credits that can be generated. If the results of the soil testing are favorable and indicate that sufficient trading credits can be achieved, the Village will consider moving forward with implementing the WQT project.

4.5 Prepare and Submit Water Quality Trading Plan

The Village will submit a water quality trading plan to the Wisconsin DNR, which will identify all projects to be completed, the anticipated number of credits for each project, and required supporting documentation.

The trading plan will include signed water quality trade agreements between the landowner and Village. The trading plan is proposed to be submitted during Year 3 of the PMP.

4.6 Design and Construct Projects

Once the WQT Plan has been approved by the Wisconsin DNR, the Village will begin design of the proposed practices. Coordination with County LCD staff and the landowners will occur as needed during the design process. Plans and specifications will be submitted to the Wisconsin DNR for review and approval once complete. Following approval, the projects will be bid and constructed by a licensed contractor.

Design and construction is anticipated to occur during Years 4 and 5 of the PMP.

4.7 Documentation and Maintenance of Projects

Following completion of construction, the trading projects will be registered with the Wisconsin DNR and will begin generating credits.

The Village will complete inspections of the project at an appropriate frequency to verify that the practice is in good condition and is generating credits per design. The Village will be responsible for completing any required maintenance and/or repairs to practice for as long as it is intended to

generate trading credits. The Wisconsin DNR will be notified any time repairs to the practice are required.

Currently, the Village anticipates having sufficient credits being generated by the end of the five-year IPV permit term.

5 FINANCIAL AND CAPACITY BUILDING

As part of the PMP, the Village proposes to complete an annual review of the sewer budget and determine if an increase of user rates is required to generate funding for implementing the PMP and constructing the proposed WQT projects. The Village's most recent sewer user rate increase occurred in 2021.

Where possible, the Village will direct funding to a new budget line to create savings for the future expenses. Once construction of the WQT practices are complete, funding will continue be reserved for maintenance and upkeep of the projects.

Additionally, the Village will review the existing sewer ordinance for chapters that could be revised with language intended to reduce phosphorus inputs to the collection system. Examples of this may include restrictions on disposal of food waste to the collection system, or limitations on types of cleaning products that may be used by businesses. The Village's sewer ordinance was last updated in August 2016.

6 PROPOSED PMP SCHEDULE

ACTION ITEMS	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
RESIDENTIAL & COMMERCIAL INFLUENT / SOURCE REDUCTION:					
1. DISTRIBUTE INFORMATION REGARDING TP REDUCTION PRACTICES	X				
2. EVALUATE INDIVIDUAL BUSINESSES FOR POTENTIAL TP REDUCTION	X				
3. EVALUATE PHOSPHORUS IN VILLAGE'S DRINKING WATER SUPPLY	X				
4. PERIODICALLY SAMPLE INFLUENT PHOSPHORUS AT WWTP	X				
5. REVIEW AND ADDRESS I/I IN THE VILLAGE'S COLLECTION SYSTEM	X	X	X	X	X
IN-PLANT OPTIMIZATION:					
1. VARY CHEMICAL DOSING AS CONDITIONS/EFFLUENT QUALITY CHANGE	X	X	X	X	X
2. EVALUATE USING CHEMICAL DOSING TO WASTED SLUDGE/DIGESTERS	X	X			
3. EVALUATE COST-EFFECTIVENESS OF ALTERNATIVE COAGULANTS	X	X			
WATER QUALITY TRADING PLANNING:					
1. QUANTIFY EXPECTED OFFSET OF NON-POINT PHOSPHORUS CREDITS TO COMPLY WITH FINAL PHOSPHORUS LIMITS	X				
2. IDENTIFY ELIGIBLE WATERSHED AREA AND IDEAS FOR PROJECTS	X	X			
3. MEET WITH COUNTY LCD STAFF TO DISCUSS POTENTIAL PROJECTS		X	X	X	X
4. SURVEY POTENTIAL PROJECT LOCATIONS AND FIELD TEST FOR TP		X	X		
5. DEVELOP WATER QUALITY TRADING PLAN		X	X		
6. DESIGN AND COMPLETE PLANS AND SPECIFICATIONS FOR PROJECTS				X	
7. COMPLETE CONSTRUCTION OF PROJECTS AND SUBMIT DOCUMENTATION					X
FINANCIAL AND CAPACITY BUILDING:					
1. COMPLETE ANNUAL REVIEW OF SEWER BUDGET AND USER RATES TO VERIFY FUNDING FOR MAINTAINING THE PMP AND PROPOSED ACTIONS	X	X	X	X	X
2. DIRECT FUNDING TO BUDGET LINE FOR IMPLEMENTATION AND MAINTENANCE OF FUTURE NON-POINT PHOSPHORUS REDUCTION PROJECTS		X	X	X	X
3. REVIEW AND UPDATE VILLAGE'S SEWER ORDINANCE		X	X		
REGULATORY REPORTING:					
1. SUBMIT ANNUAL PMP UPDATES AS REQUIRED BY WPDES PERMIT	X	X	X	X	X